

Claims

1. A process of recovering one or more deoxy sugars from a solution derived from biomass, characterized by
subjecting said solution to one or more of steps (1), (2) and (3):
(1) at least one chromatographic fractionation using a column packing material selected from strongly acid cation exchange resins,
(2) at least one chromatographic fractionation using a column packing material selected from weakly acid cation exchange resins and weakly basic anion exchange resins,
(3) at least one chromatographic fractionation using a column packing material selected from strongly basic anion exchange resins, and
recovering from fractionations (1), (2) and/or (3) one or more fractions enriched in at least one deoxy sugar.
2. A process as claimed in claim 1, characterized by subjecting said solution to two or more of steps (1), (2) and/or (3).
3. A process as claimed in claim 1, characterized by subjecting said solution two or more times to steps selected from steps (1), (2) and/or (3).
4. A process as claimed in claim 1, characterized in that the process comprises recovering a fraction enriched in rhamnose from step (1).
5. A process as claimed in claim 1, characterized in that the process comprises recovering a fraction enriched in methyl- α -D-xylose from step (2).
6. A process as claimed in claim 1, characterized in that the process comprises recovering a fraction enriched in fucose from step (3).
7. A process as claimed in claim 1, characterized in that the process comprises recovering a fraction rich in rhamnose, fucose or methyl- α -D-xylose in one of steps (1), (2) or (3).
8. A process as claimed in claim 1, characterized in that the process comprises subjecting said solution derived from biomass to chromatographic fractionation using a column packing material selected from strongly basic anion exchange resins and recovering a fraction enriched in fucose.
9. A process as claimed in claim 1, characterized in that the process comprises the following sequential steps:
 - (1) subjecting said solution derived from biomass to chromatographic fractionation using a column packing material selected from strongly

acid cation exchange resins and recovering a fraction enriched in rhamnose and/or one or more fractions containing deoxy sugars selected from methyl- α -D-xylose and fucose,

(2) subjecting said one or more fractions containing methyl- α -D-xylose and fucose to chromatographic fractionation using a column packing material selected from weakly acid cation exchange resins and recovering a fraction enriched in methyl- α -D-xylose and a fraction containing fucose,

(3) subjecting said fraction containing fucose to chromatographic fractionation using a column packing material selected from strongly basic anion exchange resins and recovering a fraction enriched in fucose.

10. A process as claimed in claim 1, characterized in that said strongly acid cation exchange resin is in Na^+ form.

11. A process as claimed in claim 1, characterized in that said strongly acid cation exchange resin is in Zn^{2+} form.

12. A process as claimed in claim 1, characterized in that said weakly acid cation exchange resin is in Na^+ form.

13. A process as claimed in claim 1, characterized in that said strongly basic anion exchange resin is in HSO_3^- form.

14. A process as claimed in claim 1, characterized in that said solution derived from biomass is a biomass hydrolyzate containing one or more deoxy sugars.

15. A process as claimed in claim 14, characterized in that said biomass hydrolyzate containing one or more deoxy sugars is a spent liquor obtained from a pulping process.

16. A process as claimed in claim 15, characterized in that said spent liquor has been obtained from hardwood pulping.

17. A process as claimed in claim 14, characterized in that said biomass hydrolyzate containing one or more deoxy sugars is selected from a sugar beet-derived solution and a sugar cane-derived solution.

18. A process as claimed in claim 1, characterized in that said process further comprises subjecting said one or more fractions enriched in one or more deoxy sugars to crystallization.

19. A process as claimed in claim 18, characterized in that said crystallization is carried out using evaporation and cooling crystallization.

20. A process as claimed in claim 18, characterized in that said one or more deoxy sugars are selected from fucose.

21. A process as claimed in claim 20, characterized in that fucose is crystallized from a solvent selected from water, an alcohol, preferably ethanol, and a mixture of water and an alcohol, preferably a mixture of water and ethanol.

22. A process as claimed in claim 21, characterized in that the crystallization solvent is water.

23. A process as claimed in claim 20, characterized in that the crystallization of fucose is carried out from a solution containing more than 45% fucose on DS.

24. A process as claimed in claim 23, characterized in that the crystallization of fucose is carried out from a solution containing more than 80% fucose on DS.

25. A process as claimed in claim 23, characterized in that the crystallization of fucose is carried out from a solution containing less than 20% rhamnose, less than 15% xylose, less than 3% arabinose and less than 1% galactose on DS.

26. A process as claimed in claim 23, characterized in that the crystallization of fucose is carried out from a solution containing more than 45% fucose, less than 20% rhamnose, less than 15% xylose, less than 3% arabinose and less than 1% galactose on DS.

27. A process for the crystallization of fucose, characterized in that the crystallization of fucose is carried out from a biomass-derived solution containing more than 45% fucose, less than 20% rhamnose, less than 15% xylose, less than 3% arabinose and less than 1% galactose.

28. A process as claimed in claim 26 or 27, characterized in that said crystallization is carried out at a temperature range of 0 to 100°C.

29. A process as claimed in claim 26 or 27, characterized in that the viscosity of the resulting crystallization mass is in the range of 5 to 500 Pas.

30. A process as claimed in claim 26 or 27, characterized in that the crystallization is carried out using a mixture of water and ethanol as the solvent.

31. A process as claimed in claim 26 or 27, characterized in that the crystallization is carried out with a residence time of 0.5 to 10 days.

32. A process for the crystallization of fucose, characterized in that the crystallization of fucose is carried out from a biomass-derived solu-

tion containing more than 80% fucose, less than 20% rhamnose, less than 15% xylose, less than 3% arabinose and less than 1% galactose on DS.

33. A process as claimed in claim 32, characterized in that the crystallization of fucose is carried out in a temperature range of 0 to 100°C.

34. A process as claimed in claim 32, characterized in that the crystallization of fucose is carried out with a residence time of 6 to 80 hours.

35. A process as claimed in claim 20, characterized in that the crystallization of fucose is carried out by fractional crystallization.

36. A process as claimed in claim 35, characterized in that the process provides crystalline fucose with a purity of more than 60%, preferably more than 90% and most preferably more than 99% on DS.

37. A process as claimed in claim 18, 27 or 32, characterized in that the process comprises washing the crystals obtained from the crystallization.

38. A process as claimed in claim 37, characterized in that the washing agent is selected from water, an organic solvent or a mixture thereof.

39. A process as claimed in claim 1, characterized in that said fucose is L-fucose.

40. A process as claimed in claim 1, characterized in that said rhamnose is L-rhamnose.

41. Crystalline fucose, characterized in that it has a melting point higher than 141°C, preferably higher than 142°C and most preferably higher than 142.5°C, and a purity higher than 99% on DS.

42. Crystalline fucose as claimed in claim 41, characterized in that it has a melting point higher than 145°C.

43. Crystalline fucose as claimed in claim 42, characterized in that it is obtainable by a method in accordance with any one of claims 24 to 34, 36 and 37.

44. Crystalline fucose as claimed in any one of claims 41 to 43, characterized in that said fucose is L-fucose.